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A Randomized Controlled Trial of Screening and Brief Interventions for Substance Misuse in Reproductive Health

Steve MARTINO, PhD^{1,2}, Steven J. ONDERSMA, PhD³, Ariadna FORRAY, MD¹, Todd A. OLMSTEAD, PhD⁴, Kathryn GILSTAD-HAYDEN, MS¹, Heather B. HOWELL, MSW¹, Trace KERSHAW, PhD⁵, Kimberly A. YONKERS, MD^{1,5,6}

¹Department of Psychiatry Yale University School of Medicine, West Haven, Connecticut

²VA Connecticut Healthcare System, West Haven, Connecticut

³Department of Psychiatry & Behavioral Neurosciences & Merrill-Palmer Skillman Institute, Detroit, Michigan

⁴Lyndon B. Johnson School of Public Affairs, University of Texas at Austin, Austin, Texas

⁵Division of Chronic Disease, Yale University School of Epidemiology and Public Health, New Haven, Connecticut

⁶Department of Obstetrics, Gynecology, & Reproductive Sciences, Yale University School of Medicine

Abstract

Background—Screening, Brief Intervention, and Referral to Treatment may reduce substance misuse but has received minimal study among women treated in reproductive health settings.

Objective—To determine whether Screening, Brief Intervention and Referral to Treatment delivered either electronically or by clinician is more effective than enhanced usual care in decreasing days of primary substance use.

Study Design—Women from two reproductive centers who smoked cigarettes or misused alcohol, illicit drugs, or prescription medication were randomly allocated to Screening, Brief Intervention and Referral to Treatment delivered electronically or by clinician or to enhanced usual care. Assessments were completed at baseline, and 1-, 3- and 6- months post-baseline. Co-primary outcomes were days/month of primary substance use and post-intervention treatment utilization. A sample size of 660 women was planned; randomization was stratified by primary substance use

Corresponding Author: Steve Martino, Ph.D., Department of Psychiatry, VA Connecticut Healthcare System (116B), 950 Campbell Avenue, West Haven, CT 06516, 203-932-5711 ext. 7418 (work), 203-470-2358 (cell), 203-937-4951 (fax), steve.martino@yale.edu.

Conflict of Interest: Dr. Ondersma discloses that he is part-owner of Interva, Inc., which markets the intervention authoring tool that was used to develop the electronic intervention for this study. Dr. Yonkers discloses royalties from Up-To-Date, Marinus Pharmaceuticals and Juniper Pharmaceuticals. Other authors have nothing to disclose.

Disclaimer: Dr. Martino is a full-time federal employee.

Trial Registration: <https://clinicaltrials.gov>; clinicaltrials.gov Identifier: .

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and pregnancy status. Screening, Brief Intervention and Referral to Treatment groups were compared to enhanced usual care using generalized estimating equations and effect sizes were calculated using Cohen's d.

Results—Between September 2011 and January 2015 women randomized included: 143 (16.8% pregnant) in electronic-delivered Screening, Brief Intervention and Referral to Treatment, 145 (18.6% pregnant) in clinician-delivered Screening, Brief Intervention and Referral to Treatment, and 151 (19.2% pregnant) in enhanced usual care; retention was >84%. Based upon the generalized estimating equations model, predicted mean days per month of use at baseline for primary substance were 23.9 (95% CI=22.4–25.5) for electronic-delivered Screening, Brief Intervention and Referral to Treatment, 22.8 (95% CI=21.4–24.3) for clinician-delivered Screening, Brief Intervention and Referral to Treatment and 23.5 (95% CI=22.2, 24.9) for enhanced usual care, which respectively declined to 20.5 (95% CI=19.0–22.2), 19.8 (95% CI=18.5–21.3), and 21.9 (95% CI=20.7–23.1) at one month, 16.9 (95% CI=15.0–19.0), 16.6 (95% CI=14.8–18.6), and 19.5 (95% CI=18.1–21.1) at three months, and 16.3 (95% CI=14.3–18.7), 16.3 (95% CI=14.4–18.5), and 17.9 (95% CI=16.1–19.9) at six months. Estimated declines were greater in electronic-delivered Screening, Brief Intervention and Referral to Treatment [β (SE) = –0.090(0.034), $p=0.008$; Cohen's d =0.19 at one month, 0.30 at three months, and 0.17 at six months] and clinician-delivered Screening, Brief Intervention and Referral to Treatment [β (SE) = –0.078(0.037), $p=0.038$; Cohen's d =0.17 at one month, 0.22 at three months, and 0.06 at six months] compared to enhanced usual care. Treatment utilization did not differ between groups.

Conclusion—Screening, Brief Intervention and Referral to Treatment significantly decreased days of primary substance use among women in reproductive healthcare centers; neither resulted in more treatment utilization than enhanced usual care.

Condensation and Short Version of Title

Screening and brief intervention, delivered electronically or by clinician, was more effective than enhanced usual care in reduction of days of substance use among women.

Keywords

Brief intervention; motivational interviewing; primary care; reproductive health; screening; substance use; treatment utilization

Introduction

Women are at highest risk of developing a substance use disorder during their reproductive years (18–44), yet 85% of those who need care for substance misuse neither receive it, nor feel they need it.¹ Screening, Brief Intervention, and Referral to Treatment (SBIRT) is a proactive technique that identifies individuals who likely misuse substances and provides a brief intervention that enhances their motivation to reduce or stop substance misuse and to seek treatment.² SBIRT is efficacious for reducing unhealthy alcohol^{3, 4} and tobacco use^{5–7} and less well established for decreasing illicit drug use or increasing treatment engagement,^{8–10} although some recent reports indicate SBIRT can be used successfully to reduce non-injection drug use in medical settings.^{11, 12} The American Congress of Obstetricians and Gynecologists (ACOG) recommends substance use screening and referral to assist women

who can benefit from treatment.¹³ Establishing efficacy in this group is critical because it includes women who are pregnant or contemplating pregnancy and have special concerns.¹³

The brevity of SBIRT has increased its reach in many medical settings, and its proactive approach is critical for reaching the non-treatment seeking majority.¹⁴ However, requisite training and time commitment still constitute implementation barriers.¹⁵ Electronic administration of SBIRT (e-SBIRT) can reduce time commitment and training needs and enhance SBIRT's reliable delivery. Several randomized trials support the acceptability and efficacy of e-SBIRT for postpartum substance misuse.^{16, 17} One trial showed equivalence between electronic- and counselor-delivered brief interventions for reduction in drug use among general medical patients in a primary care setting, although there was no control condition.^{18, 19} The purpose of this study was to test the efficacy of SBIRT, based upon motivational principles² and delivered as a single session either electronically via a tablet computer or by trained clinicians. Both SBIRTs were compared to enhanced usual care for women in reproductive healthcare clinics. Our main outcomes were days per month of primary substance use and post-SBIRT substance use treatment utilization.

Materials and Methods

This study was a randomized controlled trial that allocated women into three groups: e-SBIRT, clinician-delivered SBIRT (SBIRT), or an educational pamphlet plus existing treatment resources that constituted enhanced usual care (EUC, the control condition). Data collection occurred between September 5, 2011 and January 28, 2015. The study was approved by an institutional review board and included a certificate of confidentiality from the National Institutes of Health. The trial is registered at [ClinicalTrials.gov](https://clinicaltrials.gov), .

Women in two urban academic hospital-based reproductive healthcare clinics were voluntarily screened for cigarette smoking, or misuse of alcohol, illicit drugs, or prescription medication. Screening took place during usually scheduled reproductive health visits and were conducted by research assistants using an audio-enabled, computer-assisted self-interview (A-CASI) tool. Women were informed about the study prior to screening. Eligible participants were non-pregnant and pregnant women, at least 18 years old, who scored positive on the World Health Organization substance use screener, the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST).²⁰ Substance specific scores on the ASSIST range between 0 and 33; a brief intervention is recommended for scores between 4 and 26 for all substances other than alcohol, for which the range is 11 to 26.²⁰ Following ASSIST guidelines, for all substances other than alcohol, the cutoff for inclusion in this study was a score of ≥ 4 indicating use weekly or more in past 3 months, or less frequent use with consequences; for alcohol, our cutoff was 11 for non-pregnant women and 6 for pregnant women. Exclusions were: (1) current or imminent incarceration or hospitalization; (2) inability to provide contact information for two persons; (3) participation in substance use treatment or self-help programs in the past 3 months; (4) or inability to interview and consent in English. All participants provided written informed consent and received compensation in gift cards for completion of study assessments (\$40 at baseline, \$50, \$60, and \$100 for the respective 1-, 3-, and 6-month follow-ups).

Participants were randomized to treatment condition using urn randomization,²¹ balancing on primary substance (nicotine/alcohol/marijuana/drug) and pregnancy (pregnant/not pregnant). An individual's response to SBIRT may vary with different primary substance use,³⁻⁹ and many women substantially decrease or stop substance use in pregnancy,²² potentially confounding treatment effects if treatment groups were not balanced on these variables. We used the gRand urn randomization program (version 1.1) that runs in Microsoft Access. Research staff ran the program from a laptop computer to assign participants to condition, and did so following the baseline assessment to decrease bias. While most follow-up assessments were completed by a different research staff person from the one who originally assigned condition, this was not always logistically possible and, therefore, blinding was not guaranteed in the study.

All participants received a handout listing local treatment and self-help services. Both single-session, 20-minute SBIRTs were based on motivational interviewing (MI), an evidenced-based, patient-centered, brief therapeutic approach that helps patients resolve ambivalence toward positive behavioral change.²³ The e-SBIRT (described in detail elsewhere²⁴) featured an interactive, three-dimensional, mobile narrator that delivered the intervention. The goal was to support the importance of, and a woman's confidence in, cutting down or quitting substances and obtaining treatment. The approximately 20-minute SBIRT incorporated the same MI components provided in e-SBIRT, except that the clinicians had discretion in delivering them. Two study nurses, three social workers, and one obstetrician-gynecologist received a 15-hour SBIRT workshop training followed by practice cases with feedback and coaching and monthly group supervision during the trial, all provided by the primary author (SM) per current standards.²³ Afterward, a sample of audio recorded SBIRT sessions were rated with the Independent Tape Rater Scale²⁵ to ensure the treatment was delivered as designed (with fidelity). Enhanced usual care involved a 2-minute interaction in which patients were informed about their level of substance use risk as derived from the ASSIST and told about local treatments listed on the handout that could help them cut down or stop their use.

Assessments were completed at baseline and 1-, 3- and 6-months post-randomization using A-CASI to collect: demographics; ASSIST scores; participant-identified primary substance; substance use diagnoses from the Mini-International Neuropsychiatric Inventory (version 5.0.0);²⁶ the Fagerstrom Test for Nicotine Dependence;²⁷ and post-SBIRT substance use treatment and self-help information (e.g., Alcoholics Anonymous) from the Treatment Utilization Form.²⁸ Timeline Followback (TLFB) interviews²⁹ were delivered via trained research staff, who used calendar-based recall methods to collect information on substances used during prior 28 days.

While the TLFB provided daily data on substance use, we also collected urine samples at each assessment. The short window of detection (a few days) for urine toxicology tests renders this a suboptimal outcome for the many weeks between assessments but testing enhances the veracity of self-report.³⁰ Samples were tested for physiologic temperature to reduce risk of tampering, and were analyzed by Redwood Toxicology Labs (Santa Rosa, CA) for drugs (amphetamines, barbiturates, benzodiazepines, buprenorphine, cocaine, methadone, methaqualone, opiates, oxycodone, phencyclidine, propoxyphene,

cannabinoids), alcohol (EtG/EtS), and nicotine (cotinine) using an enzyme immunoassay procedure. False negative rates per urine analysis were low and similar across conditions and assessment points, supporting the equivalent veracity of self-reports among randomized groups and mitigating concerns about unblinded data collection (Supplementary Table 1).

We pre-specified co-primary outcomes: (1) self-reported days of primary substance use per month (28 days), and (2) treatment utilization (substance use treatment and self-help programs), both assessed at 1-, 3-, and 6-months post randomization. We created seven non-overlapping time intervals (baseline and months 1–6) from the TLFBs collected at each assessment point. Missing data were collected at subsequent assessments when possible. Intervals with fewer than 14 days were coded as missing (0.1% of possible data points); intervals containing between 14 and 27 days were extrapolated to 28 days (1.6% of possible data points). Treatment utilization during follow-up was based upon self-report, but, with the exception of self-help programs, were verified with treatment providers. We also reviewed medical records for use of medication indicative of treatment (e.g., nicotine replacement therapy). Only verified reports were used in the analyses.

Using the 3-group design, a significance threshold of 2-sided P values $< .05$, an effect size of .28, and expected 10% loss to follow-up, an *a priori* power analysis resulted in a target sample size of 660. A 25% reduction in funding support led to a reduced final sample size. Power analysis was conducted with PS Power.³¹ The reduced sample size did not alter study methods or planned analyses.

We examined between-group differences in days/month of primary substance use over time using generalized estimating equations (GEE) to allow for analysis of auto-correlated, count outcome variables. We specified a negative binomial distribution to account for over-dispersion (i.e. variance $>$ mean) in the days/month of primary substance use, a log link function, and a first-order autoregressive working correlation structure. We estimated β coefficients using quasi-likelihood estimation methods and sandwich/empirical standard errors were calculated. Explanatory variables in the GEE model included treatment group (0=EUC, 1=e-SBIRT, 2=SBIRT), time, and treatment group by time interaction. We modeled time as a continuous variable for months 0 to 6, and included linear and quadratic effects of time to test for a curvilinear relationship between substance use and time (i.e., that the effects of a brief intervention like SBIRT would attenuate over time). The primary effect of interest was the treatment group by time interaction. Multiple logistic regression analyses were performed to examine differences in treatment utilization between treatment groups, adjusted for the same stratifying variables. Holm's step-down multiple testing procedure was applied to control the Type 1 error rate. All analyses were intention-to-treat and conducted using SAS 9.4 (Cary, NC).

Results

We approached 2,421 women for screening, and randomized 439 (e-SBIRT =143 (16.8% pregnant), SBIRT=145 (18.6% pregnant), EUC=151 (19.2% pregnant); Figure 1). Retention rates exceeded 84% at all follow-up points and were comparable between groups. The three intervention groups were similar demographically (Table 1): most were non-Hispanic,

African-American, (66.7%), non-pregnant (81.8%) women in their early 30s, not living with a spouse or partner (55.1%), and not working (66.3%). Most had graduated high school or some form of post-secondary education (66.6%). The mean ASSIST score of 22.5[SD=8.1] for the primary substance indicated a moderate risk. Substance use rates were similar between intervention groups. At baseline, women reported using their primary substance 23.7[SD,7.9] days in the past month. Among pregnant women, days of past month primary substance use were 23.1[SD,8.3] days (raw data; see Table 1). Most participants met diagnostic criteria for nicotine use disorder (56.4%) while 33.7%, 27.7%, and 20.2% met criteria for cannabis, alcohol, or another illicit drug use disorder, respectively. Diagnoses for the pregnant subset were: 50.6%, 38.0%, 13.9%, and 10.1% for nicotine, cannabis, alcohol or another illicit drug use disorder, respectively.

Of those randomized, 436 (99%) received the intervention on the same day as the baseline assessment. Three women did not show for the intervention following randomization. Six women were enrolled in error after baseline (one reported no substance use the prior month and five disclosed substance use treatment during the 3-month period preceding baseline assessment). Independent fidelity ratings with 50% of the SBIRT sessions showed clinicians demonstrated adequate to very good levels of MI performance (data available on request).

The GEE model (Table 2) included pregnant and non-pregnant women. Independent of pregnancy status, treatment group by linear and quadratic time interactions were significant for both e-SBIRT and SBIRT, even after applying the Holm's procedure to adjust for two comparisons. These interactions were due to initially steeper declines in days/month of use followed by an earlier leveling off for the women receiving either form of SBIRT versus EUC, as illustrated in Figure 2. Based upon the GEE model, the predicted mean days/month of substance use at baseline were 23.9 (95% CI=22.4–25.5) for e-SBIRT, and declined to 20.5 (95% CI=19.0–22.2), 16.9 (95% CI=15.0–19.0), and 16.3 (95% CI=14.3–18.7) at months 1, 3 and 6, respectively, yielding Cohen's $d=0.19$ at one month, 0.30 at three months, and 0.17 at six months. Similar declines were seen in the SBIRT group; mean use was 22.8 (95% CI=21.4–24.3) days per month at baseline, 19.8 (95% CI=18.5–21.3) at month 1 (Cohen's $d=1.9$), 16.6 (95% CI=14.8–18.6) at month 3 (Cohen's $d=0.22$) and 16.3 (95% CI=14.4–18.5) at month 6 (Cohen's $d=0.06$). More modest declines were seen in EUC, wherein mean baseline use was 23.5 (95% CI=22.2, 24.9) days/month that declined to 21.9 (95% CI=20.7–23.1), 19.5 (95% CI=18.1–21.1), and 17.9 (95% CI=16.1–19.9) at months 1, 3 and 6, respectively. A post-hoc analysis showed that the SBIRT groups did not differ significantly from each other (Supplementary Table 2). The same pattern of results occurred when the model examined the outcome of self-reported days/month of any, rather than only primary, substance use (Supplementary Table 3).

Pregnant women reported substance use, on average, about 17% fewer days per month than did non-pregnant women. Modeled means, by pregnancy status, are shown in Figure 2. Three-way interactions between treatment, time and pregnancy status did not differ significantly in the effect of treatment over time between pregnant and non-pregnant women, although our study was not powered to test this difference.

Overall, 121(27.6%) women utilized substance use treatment or self-help programs post-SBIRT across follow-up points. About half of the services they sought were for smoking cessation (Table 3). Statistical models (Table 4) did not reveal differences in utilization between groups. To better understand whether the severity of risk for substance-related problems moderated utilization, we conducted two sensitivity analyses. The first model adjusted for ASSIST score and the second included only women with an ASSIST score 27 (indicating need for more intensive intervention beyond a brief intervention). No differences in odds of treatment utilization by treatment group were found in these additional models (Supplementary Tables 4 and 5).

Comment

In this investigation of women in reproductive health settings, both e-SBIRT and SBIRT significantly reduced days of primary substance use over the follow-up period compared to EUC. There was no interaction for pregnancy status, indicating that the response was similar for pregnant and non-pregnant women. At 3 months, substance use was reduced by 4 days in the usual care group, 7 days in the e-SBIRT and 6.3 days in the SBIRT group; differences were attenuated at 6 months. Exploratory analyses bolstered the strength of the primary outcome by showing all substance use decreased at a higher rate in the SBIRT groups compared to EUC. These encouraging results are counterbalanced by the lack of difference in treatment seeking among groups.

Recent studies examining the efficacy of SBIRT for drug use in mixed gender, primary care settings have had null findings.^{8, 9} However, other work shows that younger women receiving services in inpatient medical settings³² and emergency departments³³ benefit more from SBIRT than men. Women in their reproductive years may be uniquely receptive to SBIRT because substance use places their health and the wellbeing of their children or pregnancy at risk.² Our study included women who were largely in their early 30s, 18% of whom were pregnant. Participants were seeking reproductive healthcare services and may have recognized adverse consequences caused by their substance use in this context. A reduction of even a few days per month of substance use is likely to reduce some of these risks (e.g., decreasing drinking during pregnancy can improve pregnancy outcomes).^{34, 35}

Although the study was not designed to compare two SBIRT modalities, the mode in which SBIRT was delivered did not appear to influence outcomes. The comparative effectiveness of these two SBIRTs requires further evaluation. However, prior work using a different intervention developed with the same e-SBIRT platform performed as well as an in-person brief intervention for drug misuse at 3- and 12-month follow-ups,^{18, 19} although, these trials did not include a control condition. In contrast, other trials with this platform, using interventions more similar to that used in the present study, significantly decreased illicit drug use among postpartum women¹⁶ and smoking during pregnancy.³⁶ The interactive nature of the program, use of tailored content based on respondents' motivational levels, and feedback about issues salient to women (e.g., effects of substance use on children) may have contributed to e-SBIRT being on par with SBIRT. The potential benefits of increasing access to SBIRT via electronic delivery (e.g., reliability, reduced staffing needs, easier implementation) are well documented,¹⁷ and it may be more cost-effective.

Past studies show that brief advice and MI-based counseling are efficacious for dependent smokers,^{5–7} particularly when combined with pharmacological treatment.³⁷ Most women in our study (57.2%) reported nicotine as their primary substance. However, both SBIRT delivery platforms allowed for targeting other problematic substance use by tailoring content to the participant's preferred focus. This 'all comers' approach makes sense from an implementation perspective in that one SBIRT application may be used to help women with a variety of different substance use problems.³⁸

Neither SBIRT method influenced treatment utilization, even after adjustment for baseline risk severity for primary substance use. About a quarter of participants accessed professional treatment or self-help programs during follow-up; half of this utilization was for smoking cessation purposes. This finding is consistent with low levels of treatment-seeking generally¹ and with the fact that women in this cohort were not presenting for substance use treatment. Moreover, other than nicotine dependence, most women did not meet criteria for a substance use disorder, and those who reported non-nicotine primary substance generally had moderate rather than severe risk wherein a brief intervention without referral to treatment may be sufficient.² Perhaps a goal of decreasing nicotine or other substance use on their own was sufficient for these individuals, who may have seen specialty treatment as unnecessary or inappropriate. Similarly, it is possible that the need to choose a treatment provider, make an appointment, find transportation, etc., simply presents too great a barrier. Future work that assesses the integration of comprehensive substance use treatment into reproductive health settings may reduce these barriers sufficiently to allow better evaluation of the possible role of SBIRT in promoting treatment engagement for those who most likely need specialty care.

This study has numerous strengths: 1) a large group of women with a variety of substances misused; 2) inclusion of pregnant and non-pregnant women; 3) similarly formatted brief MI-based interventions to isolate potential differences in SBIRT delivery method; 4) independent verification of MI fidelity in SBIRT; 5) biochemical corroboration of primary substance use; 6) verified treatment utilization; and 7) high follow-up rates. The study also has limitations. It was conducted within urban academic healthcare settings primarily with non-Hispanic African-Americans, thereby limiting the findings' generalizability. In addition, study personnel who had been trained following best practices, and supervised monthly provided SBIRT. Hence, the magnitude of the effect of SBIRT when used by reproductive healthcare providers and staff remains to be determined. Finally, recruitment goals were decreased although power appears adequate given the significant condition differences.

In sum, a 20-minute SBIRT reduced days of primary substance use compared to EUC among women seeking reproductive health services. This finding supports the ACOG's opinion that use of SBIRT can reduce or stop the use of substances that risk harm to women's health and the health of their children. Increasing access to SBIRT via electronic delivery may be a cost-effective and practical approach for implementing this intervention in busy reproductive healthcare centers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Participant Flow in the Trial of Electronic- and Clinician-Delivered SBIRT

Participant flow diagram according to CONSORT guidelines. ^ano use in 28 days prior to randomization; ^bpatient in treatment prior to randomization

Figure 2: Mean Days of Any Substance Use By Treatment Group and Stratified By Pregnancy Status

EUC, Enhanced Usual Care **e-SBIRT**, electronically delivered Screening, Brief Intervention and Referral to Treatment; **SBIRT**, clinician delivered Screening, Brief Intervention and Referral to Treatment. Notes: i. Results are based upon a Generalized Estimating Equation Model Predicting Days/Month of primary substance use, adjusted for treatment group, linear and quadratic effects of time, treatment x (linear and quadratic) time interactions, pregnancy status and primary substance use; ii. Pregnancy status and primary substance use was fixed at not pregnant and nicotine (the largest groups); iii. Standard error bars are shown; iv. Numbers at the bottom, inside of graph represent modeled mean number of days/month of primary substance use by month and treatment group.

Table 1.

Baseline Characteristics of Randomized Participants (N = 439)

Characteristic	N	Overall (N = 439)	e-SBIRT (N = 143)	SBIRT (N = 145)	EUC (N=151)
Demographics					
Age in years, mean (SD)	439	34.2 (11.1)	34.6 (10.3)	33.6 (10.9)	34.4 (12.0)
Race/Ethnicity, N (%)	439				
African-American, non-Hispanic		293 (66.7)	93 (65.0)	102 (70.3)	98 (64.9)
Caucasian-American, non-Hispanic		58 (13.2)	16 (11.2)	19 (13.1)	23 (15.2)
Hispanic-American		65 (14.8)	22 (15.4)	19 (13.1)	24 (15.9)
Other Race/Ethnicity ^a		23 (5.2)	12 (8.4)	5 (3.5)	6 (4.0)
Marital Status, N (%)	439				
Married / living with partner		197 (44.9)	54 (37.8)	70 (48.3)	73 (48.3)
Other living situation		242 (55.1)	89 (62.2)	75 (51.7)	78 (51.7)
Pregnant, N (%)	439	80 (18.2)	24 (16.8)	27 (18.6)	29 (19.2)
Education, N (%)	437				
Some high school or less		146 (33.4)	48 (34.0)	46 (31.7)	52 (34.4)
High school graduate		181 (41.4)	60 (42.6)	64 (44.1)	57 (37.8)
Beyond high school		110 (25.2)	33 (23.4)	35 (24.1)	42 (27.8)
Employment status, N (%)	439				
Full time		66 (15.0)	28 (19.6)	18 (12.4)	20 (13.3)
Part time		82 (18.7)	26 (18.2)	24 (16.6)	32 (21.2)
Not working		291 (66.3)	89 (62.2)	103 (71.0)	99 (65.6)
Substance Use					
Primary Substance ^b , N (%)	439				
Nicotine		251 (57.2)	80 (55.9)	81 (55.9)	90 (59.6)
Alcohol		51 (11.6)	23 (16.1)	15 (10.3)	13 (8.6)
Cannabis		90 (20.5)	27 (18.9)	32 (22.1)	31 (20.5)
Other illicit drug ^c		47 (10.7)	13 (9.1)	17 (11.7)	17 (11.3)
Days/month using primary substance, mean (SD)	439	23.7 (7.9)	23.7 (7.7)	23.2 (8.3)	24.2 (7.7)
Days/month using any substance, mean (SD)	439	25.7 (5.9)	25.4 (6.2)	26.0 (5.5)	25.7 (6.1)
Substance use disorders ^d , N (%)					
Nicotine	436	246 (56.4)	76 (53.2)	81 (56.6)	89 (59.3)
Alcohol	435	121 (27.7)	37 (25.9)	38 (26.6)	46 (30.9)
Cannabis	436	147 (33.7)	41 (28.7)	51 (35.7)	55 (36.7)
Other illicit drug ^c	435	88 (20.2)	26 (18.3)	26 (18.2)	36 (24.0)
ASSIST primary substance score, mean (SD) ^e	439	22.5 (8.1)	22.8 (8.5)	22.2 (8.1)	22.5 (7.9)
FTND score, mean (SD) ^f	436	3.8 (2.7)	3.6 (2.8)	3.9 (2.7)	3.9 (2.6)

Abbreviations: **e-SBIRT**, electronically delivered Screening, Brief Intervention, and Referral to Treatment; **SBIRT**, clinician delivered Screening, Brief Intervention, and Referral to Treatment; **EUC**, Enhanced Usual Care; **ASSIST**, Alcohol, Smoking, and Substance Involvement Screening Test; **FTND**, Fagerstrom Test for Nicotine Dependence

^a Other race/ethnicity includes multiracial(n=16), Native American(n=5), Pacific Islander(n=1) and Romanian(n=1)

^b Substance that causes the most problems, as determined by the participant.

^c Other Illicit drug includes cocaine (n=38), opiates (n=4), PCP (n= 3), benzodiazepine (n=1) sleeping pills (n= 1)

^d Substance use disorder diagnoses derived from the FTND for tobacco (4) and Mini-International Neuropsychiatric Inventory 5.0.0 Clinician-Rated for all other substances

^e Scores range from 0–39; higher score is riskier use/greater severity.

^f Scores range from 0–10; higher score is greater intensity of nicotine dependence.

Table 2.

Results of Generalized Estimating Equation Model Predicting Days/Month of Primary Substance Use (N=439)

Parameter	95% Confidence			
	B Estimate	Limits Lower Upper		Pr > Z
Intercept	3.389	3.326	3.4512	<0.001
Treatment group				
e-SBIRT	0.016	-0.068	0.100	0.706
SBIRT	-0.032	-0.115	0.052	0.461
EUC	0.000	0.000	0.000	.
Month (Linear effect of time)	-0.078	-0.118	-0.038	<0.001
Month*Month (Quadratic effect of time)	0.005	0.000	0.011	0.066
Treatment x (Linear) Time Interaction				
Month * e-SBIRT	-0.090	-0.157	-0.023	0.008 ^a
Month * SBIRT	-0.078	-0.151	-0.005	0.038 ^b
Month * EUC	0.000	0.000	0.000	.
Treatment x (Quadratic) Time Interaction				
Month*Month * e-SBIRT	0.012	0.003	0.021	0.010 ^b
Month*Month * SBIRT	0.011	0.001	0.022	0.031 ^c
Month*Month * EUC	0.000	0.000	0.000	.
Pregnant (vs. not pregnant)	-0.183	-0.305	-0.061	0.003
Primary Substance				
Alcohol	-0.601	-0.783	-0.418	<0.001
Cannabis	-0.283	-0.394	-0.172	<0.001
Other Illicit Drug ^a	-0.658	-0.877	-0.440	<0.001
Nicotine	0.000	0.000	0.000	.

Abbreviations: **e-SBIRT**, electronically delivered Screening, Brief Intervention and Referral to Treatment; **SBIRT**, clinician delivered Screening, Brief Intervention, and Referral to Treatment; **EUC**, Enhanced Usual Care

^aOther Illicit drug includes cocaine, opiates, PCP, benzodiazepine, sleeping pills

^bHolm-adjusted significance level = 0.025

^cHolm-adjusted significance level = 0.05

Table 3.

Verified self-reported post-SBIRT treatment utilization (N = 121)

Type of Treatment	N (%) ^a
Smoking cessation services ^b	60 (49.6)
Medication ^c	34 (28.1)
Outpatient counseling	22 (18.2)
Alcoholics or Narcotics	13 (10.7)
Anonymous	
Inpatient residential programs	6 (5.0)
Intensive outpatient programs	5 (4.1)
Faith-based support	4 (3.3)
e-cigarettes	4 (3.3)
Other ^d	16 (13.2)

Abbreviations: **SBIRT**, Screening, Brief Intervention and Referral to Treatment^aTreatment utilization across treatment categories sums to greater than 100% because participants may have utilized more than one type of treatment.^bThese services included counseling from their primary care provider, toll-free CT Quitline telephone coaching, or dedicated smoking cessation groups at a community clinic.^cMedications included Chantix, Methadone, Nicoderm, Nicoderm C-Q ER, Nicoderm patch, Nicorette Gum, nicotine patch, Nicotine Lozenge, Suboxone, Subutex, and Welbutrin.^dOther types of treatment included faith-based counseling or peer support or case management services.

Table 4.

Results of Logistic Regression Model Predicting Treatment Utilization (N=439)

Effect	Odds Ratio	95% Wald Confidence Limits	Pr > ChiSq
Treatment Group			
e-SBIRT	0.968	0.579 1.617	0.990
SBIRT	0.931	0.559 1.551	0.810
EUC	Referent		
Primary Drug			
Alcohol	0.683	0.329 1.419	0.307
Cannabis	0.855	0.494 1.477	0.784
Other Illicit Drug ^a	1.162	0.588 2.299	0.344
Nicotine	Referent		
Pregnant (vs not pregnant)	0.981	0.563 1.709	0.945

Abbreviations: **e-SBIRT**, electronically delivered Screening, Brief Intervention and Referral to Treatment; **SBIRT**, clinician delivered Screening, Brief Intervention, and Referral to Treatment; **EUC**, Enhanced Usual Care

^aOther Illicit drug includes cocaine, opiates, PCP, benzodiazepine, sleeping pills